

## **ATTACHMENT 2**

<b>Emission Source</b>	<b>CO2</b>	<b>N2O</b>	<b>CH4</b>	<b>Total CO2 Eq Emissions (metric tons/year)</b>
Electricity Usage Emissions	3,674.07	0.05	0.03	3,691.03
Natural Gas Usage Emissions	3,146.13	0.06	0.06	3,165.28
Water Usage Emissions	1,244.59	0.02	0.01	1,250.33
Vehicular Emissions	16,331.83	0.17	0.46	16,393.23
Solid Waste Emissions				342.00
Total	24,396.63	0.30	0.56	
Global Warming Potential	1.00	310.00	21.00	
<b>Total CO2 Eq Emissions</b>				<b>24,841.87</b>

## VEHICLE EMISSIONS CALCULATIONS

### Parameters

Average Fuel Economy	17.40 miles per gallon (mpg)
Average Daily Traffic (ADT)	8,740.00 trips
VMT per Day	87,734.00 miles
VMT per Year	32,022,910.00 miles
Total Gallons of Fuel	1,840,397.13 gallons

### Vehicle Emission Factors (pounds/gallon)

CO2	19.56400
CH4	0.00055
N2O	0.00020

### Vehicle Emissions

	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	36,005,529.38	2,204.62	16,331.83	1.00	16,331.83
CH4	1,012.22	2,204.62	0.46	21.00	9.64
N2O	368.08	2,204.62	0.17	310.00	51.76
TOTAL metrics tons of CO2 Eq per Year.					16,393.23

## ELECTRICITY EMISSIONS CALCULATIONS

### Residential Parameters

Average Monthly Consumption	590 00 kWh
Annual Consumption	7,080 00 kWh
Number of Units	844 00 Units
Total Consumption (kWh)	5,975,520 00 kWh
Total Consumption (MWh)	5,975 52 MWh

### School Parameters

Average Monthly Consumption	5,768 00 kWh
Annual Consumption	69,216 00 kWh
Total kWh	69,216 00 kWh
Total MWh	69 22 MWh

### Electricity Generation Emission Factors (pounds/MWh)

CO2	1,340 0000
CH4	0 0111
N2O	0 0192

### Residential Electricity Emissions

	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	8,007,196 80	2,204 62	3,632 00	1 00	3,632 00
CH4	66 33	2,204 62	0 03	21 00	0 63
N2O	114.73	2,204.62	0.05	310.00	16.13
TOTAL metrics tons of CO2 Eq per Year.					3,648.77

### School Electricity Emissions

Emissions	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	92,749 44	2,204 62	42 07	1 00	42 07
CH4	0 77	2,204 62	0 00	21 00	0 01
N2O	1.33	2,204.62	0.00	310.00	0.19
TOTAL metrics tons of CO2 Eq per Year.					42.26

### Total Combined Electricity Emissions

Total Emissions	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	8,099,946 24	2,204 62	3,674 07	1 00	3,674 07
CH4	67 10	2,204 62	0 03	21 00	0 64
N2O	116.06	2,204.62	0.05	310.00	16.32
TOTAL metrics tons of CO2 Eq per Year.					3,691.03

## NATURAL GAS EMISSIONS CALCULATIONS

### Residential Parameters

Consumption per Consumer per Year	67,847 00 cubic feet
Number of Units	844 00 untis
Total Consumption (cubic feet)	57,262,868 00 cubic feet
Total Consumption (million cubic feet)	57 26 million cubic feet

### School Parameters

Total Consumption (cubic feet)	537,416 00 cubic feet
Total Consumption (million cubic feet)	0 54 million cubic feet

### Natural Gas Combustion Emission Factors (pounds/million cubic feet)

CO2	120,000 0
CH4	2 3
N2O	2 2

### Residential Natural Gas Emissions

	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	6,871,544 16	2,204 62	3,116 88	1 00	3,116 88
CH4	131 70	2,204 62	0 06	21 00	1 25
N2O	125 98	2,204.62	0 06	310.00	17 71
TOTAL metrics tons of CO2 Eq per Year					3,135 85

### School Natural Gas Emissions

Emissions	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	64,489 92	2,204 62	29 25	1 00	29 25
CH4	1 24	2,204 62	0 00	21 00	0 01
N2O	1.18	2,204 62	0 00	310 00	0 17
TOTAL metrics tons of CO2 Eq per Year					29.43

### Total Combined Natural Gas Emissions

Total Emissions	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	6,936,034 08	2,204 62	3,146 13	1 00	3,146 13
CH4	132 94	2,204 62	0 06	21 00	1 27
N2O	127 16	2,204.62	0.06	310 00	17 88
TOTAL metrics tons of CO2 Eq per Year.					3,165 28

## WATER EMISSIONS CALCULATIONS

### Parameters

Daily Water Use	660,000 00 gallons
Annual Water Use	240,900,000 00 gallons
Embodied Energy	0 0085 kWh per gallon
Total Water Energy Use (kWh)	2,047,650 00 kWh
Total Water Energy Use (MWh)	2,047 65 MWh

### Electricity Generation Emission Factors (pounds/MWh)

CO2	1,340 0000
CH4	0 0111
N2O	0 0192

### Water Emissions

	Pounds	Pounds per Metric Ton	Metric Tons	GWP	CO2 Eq
CO2	2,743,851 00	2,204 62	1,244 59	1 00	1,244 59
CH4	22 73	2,204 62	0 01	21 00	0 22
N2O	39 31	2,204.62	0 02	310 00	5 53
TOTAL metrics tons of CO2 Eq per Year					1,250.33

	% Generated	% Recovered	% Discarded	Tons	Recycled	Landfill	WARM Category
Major Appliances	1.4	67.1	0.7	7,946.4	5,332.034	2,614.366	Mixed Metals
Small Appliances	0.5	1.4	0.8	2,838	0.039732	2,798.268	Mixed Metals
Furniture and Furnishings	3.7	0	5.5	21,001.2	0	21,001.2	Mixed MSW
Carpets and Rugs	1.2	8.9	1.7	6,811.2	0.606197	6,205.003	Carpet
Rubber Tires	1.9	34.8	1.9	10,784.4	3,752.971	7,031.429	Tires
Batteries, Lead-Acid	1	99.2	0	5,676	5,630.592	0.045408	Mixed MSW
Consumer Electronics	1.2	13.6	1.5	6,811.2	0.926323	5,884.877	Personal Computers
Other Miscellaneous Durables	6.9	3.5	10	39,164.4	1,370.754	37,793.65	Mixed MSW
Newspapers	4.3	77.8	1.4	24,406.8	18,988.49	5,418.31	Newspaper
Books	0.5	26.1	0.6	2,838	0.740718	2,097.282	Textbooks
Magazines	1	39.6	0.9	5,676	2,247.696	3,428.304	Magazines/Third-Class Mail
Office-Type Papers	2.4	71.8	1	13,622.4	9,780.883	3,841.517	Office Paper
Directories	0.3	20	0.3	1,702.8	0.34056	1,362.24	Phonebooks
Standard Mail	2.3	40.3	2.1	13,054.8	5,261.084	7,793.716	Magazines/Third-Class Mail
Other Commercial Printing	2.5	57.3	1.6	14,19	8,130.87	6,059.13	Mixed Paper (General)
Tissue Paper and Towels	1.4	0	2.1	7,946.4	0	7,946.4	Mixed Paper (Primarily Residential)
Paper Plates and Cups	0.5	0	0.8	2,838	0	2,838	Mixed Paper (Primarily Residential)
Plastic Plates and Cups	0.3	0	0.5	1,702.8	0	1,702.8	Mixed Plastics
Trash Bags	0.4	0	0.6	2,270.4	0	2,270.4	Mixed Plastics
Disposable Diapers	1.5	0	2.2	8,514	0	8,514	Mixed MSW
Other Nonpackaging Paper	1.8	0	2.6	10,216.8	0	10,216.8	Mixed Paper (General)
Clothing and Footwear	3.3	15	4.2	18,730.8	2,809.62	15,921.18	Mixed MSW
Towels, Sheets, and Pillowcases	0.4	17.3	0.5	2,270.4	0.392779	1,877.621	Mixed MSW
Other Miscellaneous Nondurables	1.6	0	2.5	9,081.6	0	9,081.6	Mixed MSW
Glass	4.5	28.1	4.9	25,542	7,177.302	18,364.7	Glass
Steel	1.1	64.6	0.6	6,243.6	4,033.366	2,210.234	Steel Cans
Aluminum	0.7	39	0.7	3,973.2	1,549.548	2,423.652	Aluminum Cans
Paper and Paperboard Packaging	15.7	62.4	8.9	89,113.2	55,606.64	33,506.56	Mixed Paper (General)
Plastic	5.4	11.7	7.1	30,650.4	3,586.097	27,064.3	Mixed Plastics
Wood Packaging	3.4	15.5	4.3	19,298.4	2,991.252	16,307.15	Dimensional Lumber
Other Miscellaneous Packaging	0.1	0	0.2	0,567.6	0	0,567.6	Mixed MSW
Food Scraps	12.5	2.6	18.2	70.95	1,844.7	69,105.3	Food Scraps
Yard Trimmings	12.8	64.1	6.9	72,652.8	46,570.44	26,082.36	Yard Trimmings
Miscellaneous Inorganic Wastes	1.5	0	2.2	8,514	0	8,514	Mixed MSW
	100			567.6	189,710.7	377,889.3	

	Tons	Recycled	Landfill
Aluminum Cans	3,973.2	1,549.548	2,423.652
Carpet	6,811.2	0.6061968	6,205.0032
Dimensional Lumber	19,298.4	2,991.252	16,307.148
Food Scraps	70.95	1,844.7	69,105.3
Glass	25,542	7,177.302	18,364.698

Magazines/Third-Class Mail	18 7308	7 5087804	11 2220196
Mixed Metals	10 7844	5 3717664	5 4126336
Mixed MSW	113 52	10 2037452	103 3162548
Mixed Paper (General)	113 52	63 7375068	49 7824932
Mixed Paper (Primarily Residential)	10 7844	0	10 7844
Mixed Plastics	34 6236	3 5860968	31 0375032
Newspaper	24 4068	18 9884904	5 4183096
Office Paper	13 6224	9 7808832	3 8415168
Personal Computers	6 8112	0 9263232	5 8848768
Phonebooks	1 7028	0 34056	1 36224
Steel Cans	6 2436	4 0333656	2 2102344
Textbooks	2 838	0 740718	2 097282
Tires	10 7844	3 7529712	7 0314288
Yard Trimmings	72 6528	46 5704448	26 0823552
	567 6	189 7106508	377 8893492

## **ATTACHMENT 3**

## WARM User's Guide

### Calculating Greenhouse Gas Emissions with the Excel® Version of the Waste Reduction Model

#### WHAT IS THE WASTE REDUCTION MODEL?

The Waste Reduction Model (WARM) was created by the U.S. Environmental Protection Agency (EPA) to help solid waste planners and organizations estimate greenhouse gas (GHG) emission reductions from several different waste management practices. WARM is available in a Web-based calculator format and as a Microsoft Excel® spreadsheet. Both versions of WARM are available on EPA's Web site at [http://www.epa.gov/climatechange/wycd/waste/calculators/Warm\\_home.html](http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html).

WARM calculates GHG emissions for baseline and alternative waste management practices, including source reduction, recycling, combustion, composting, and landfilling. The model calculates emissions in metric tons of carbon equivalent (MTCE) and metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>E) across a wide range of material types commonly found in municipal solid waste (MSW).

The user can construct various scenarios by simply entering data on the amount of waste handled by material type and by management practice. WARM then automatically applies material-specific emission factors for each management practice to calculate the GHG emissions and energy savings of each scenario. Several key inputs, such as landfill gas recovery practices and transportation distances to MSW facilities, can be modified by the user.

The GHG emission factors were developed following a life-cycle assessment methodology using estimation techniques developed for national inventories of GHG emissions. EPA's report *Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks* (EPA 530-R-06-004) describes this methodology in detail. For a free copy of this report, visit <http://epa.gov/climatechange/wycd/waste/SWMGHGreport.html> or call EPA's RCRA hotline at (800) 424-9346. A new version of this report was released in Fall 2006.

The methodologies used to develop these emission factors are described in detail in the background reports available for download at <http://epa.gov/climatechange/wycd/waste/SWMGHGreport.html>. This version also reflects revised data on the average recycled content values for materials available in the marketplace, and the EPA's latest MSW characterization report *Municipal Solid Waste in the United States: 2006 Facts and Figures*.

#### WHO SHOULD USE WARM?

WARM was developed for solid waste managers (from state and local governments and other organizations) who want to calculate the GHG emissions associated with different waste management options. Emissions estimates provided by WARM are intended to support voluntary GHG measurement and reporting initiatives. These initiatives include waste management components of state and local climate change action plans, and other waste management projects for which an understanding of GHG emissions is desired.

#### USING THE EXCEL® VERSION OF WARM

Before using WARM, you first need to gather data on your baseline waste management practices and an alternative scenario. In order to effectively use the tool, users should know how many tons of waste you manage (or would manage) for a given time period under each scenario by material type and by management practice. Both models allow you to customize your results based on project-specific landfill gas recovery practices and transportation distances. Note that you may use default values if you are unsure of landfill gas recovery practices and/or transportation distances.

#### Instructions:

-- Click on the "Analysis Inputs" tab at the bottom center of the screen to open the input sheet. Follow the instructions for Steps 1 and 2. This involves filling in the tables describing your baseline and proposed alternative waste management scenarios. The "mixed" material types are defined as the following:

Mixed Metals: Steel 71% , Aluminum 29%.

Mixed Plastics: HDPE 46%, LDPE 15%, PET 40%.

Mixed Recyclables: Aluminum Cans 1.4%, Steel 3.4%, Glass 5.2%, HDPE 1.0%, LDPE 0.3%, PET 0.9%, Corrugated Cardboard 46.8%.

Magazines/Third-class Mail 5.5%, Newspaper 23%, Office Paper 8.8%, Phonebooks 0.2%, Textbooks 0.4%, Dimensional Lumber 2.8%

Mixed Organics: Food Scraps 48%, Yard Trimmings 52%.

Mixed MSW- represents the entire municipal solid waste stream as disposed.

-- Fill in the data requested in Steps 3–5. WARM will use the answers to these questions to customize GHG estimates to reflect your waste management situation. For example, you are asked for data on transportation distances and on your landfill gas recovery systems, if applicable. If the requested data is not available, WARM will use the national average defaults.

-- Step 6 allows you to customize your report, with your name, organization, and project period.

-- In Step 7, choose whether to have your results displayed in either MTCE or MTCO<sub>2</sub>E.

-- To view the energy consumption impacts of your waste management scenarios, check the box in Step 8.

-- Once you have completed Steps 1–8 on the "Analysis Inputs" sheet, WARM will calculate the GHG emissions attributable to the baseline and alternative waste management scenarios you have specified. Emissions calculations are presented on separate output sheets, as described below. From the "Analysis Inputs" sheet, click on a tab at the bottom of the screen for the results sheet you want to view first.

-- The "Summary Report" sheet provides a concise report of GHG emissions from the baseline and alternative waste management scenarios, as well as an estimate of net emissions in the units selected.

-- The "Analysis Results" sheet shows GHG emissions for each scenario in the units selected. You can compare the total impact of the baseline and alternative scenarios, or, if you want more detail, you can scroll down to view GHG emissions or energy results by material type and management practice.

-- If you checked the "Energy Consumption" box on the input sheet, the model provides the equivalent sheets in units of energy consumption.

#### USING THE ONLINE VERSION OF WARM

The online WARM is a simpler version of this Excel® version, with fewer options for customization (e.g., it does not include an option to view emissions phased and/or by gas). You can access the online WARM at the following website: <http://www.epa.gov/globalwarming/actions/waste/w-online.htm>. The website also includes a User's Guide that gives detailed instructions for using both the online and Excel® version of WARM.

#### ASSISTANCE

If you need additional assistance with using WARM, please email Jennifer Brady at [brady.jennifer@epa.gov](mailto:brady.jennifer@epa.gov).

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**Prepared by:**

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[illegible]

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[illegible]0 MTCO<sub>2</sub>E

### Passenger Cars from the Roadway Each Year

a) For explanation of methodology, see the EPA report:  
Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks (EPA530-R-06-004)  
-- available on the Internet at <http://epa.gov/climatechange/wvcd/waste/downloads/fullreport.pdf> (5.6 Mb PDF file).

**Waste Reduction Model (WARM) -- Inputs**

Use this worksheet to describe the baseline and alternative MSW management scenarios that you want to compare. The shaded areas indicate where you need to enter information.

**1. Describe the baseline generation and management for the MSW materials listed below.**

If the material is not generated in your community or you do not want to analyze it, leave

it blank or enter 0. Make sure that the total quantity generated equals the total quantity managed.

Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Aluminum Cans	4	2	2		NA
Steel Cans	6	4	2		NA
Copper Wire					NA
Glass	26	7	18		NA
HDPE					NA
LDPE					NA
PET					NA
Corrugated Cardboard					NA
Magazines/Third-class Mail	19	8	11		NA
Newspaper	24	19	5		NA
Office Paper	14	10	4		NA
Phonebooks	2	0	1		NA
Textbooks	3	1	2		NA
Dimensional Lumber	19	3	16		NA
Medium-density Fiberboard					NA
Food Scraps	71	-	71		
Yard Trimmings	73	-	73		
Grass		NA			
Leaves		NA			
Branches		NA			
Mixed Paper (general)	114	64	50		NA
Mixed Paper (primarily residential)	11	-	11		NA
Mixed Paper (primarily from offices)					NA
Mixed Metals	11	5	5		NA
Mixed Plastics	35	4	31		NA
Mixed Recyclables					NA
Mixed Organics		NA			
Mixed MSW	114		114		NA
Carpet	7	1	6		NA
Personal Computers	7	1	6		NA
Clay Bricks		NA		NA	NA
Concrete <sup>1</sup>				NA	NA
Fly Ash <sup>2</sup>				NA	NA
Tires <sup>3</sup>	11	4	7		NA

Please enter data in short tons (1 short ton = 2,000 lbs.)

Please refer to the User's Guide if you need assistance completing this table.

<sup>1</sup> Recycled concrete used as aggregate in the production of new concrete

<sup>2</sup> Recycled fly ash is utilized to displace Portland cement in concrete production.

<sup>3</sup> Recycling tires is defined in this analysis as retreading and does not include other recycling activities (i.e. crumb rubber applications).

**2. Describe the alternative management scenario for the MSW materials generated in the baseline.**

Any decrease in generation should be entered in the Source Reduction column.

Any increase in generation should be entered in the Source Reduction column as a negative value.

(Make sure that the total quantity generated equals the total quantity managed.)

Material	Baseline Generation	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Aluminum Cans	4	-	2	2		NA
Steel Cans	6	-	4	2		NA
Copper Wire	-					NA
Glass	26	-	7	18		NA
HDPE	-					NA
LDPE	-					NA
PET	-					NA
Corrugated Cardboard	-					NA
Magazines/Third-class Mail	19	-	8	11		NA
Newspaper	24		19	5		NA
Office Paper	14		10	4		NA

# Analysis Inputs

Phonebooks	2		0	1	NA
Textbooks	3		1	2	NA
Dimensional Lumber	19		3	16	NA
Medium-density Fiberboard	-				NA
Food Scraps	71	NA	NA	71	
Yard Trimmings	73	NA	NA	73	
Grass	-	NA	NA		
Leaves	-	NA	NA		
Branches	-	NA	NA		
Mixed Paper, Broad	114	NA	64	50	NA
Mixed Paper, Resid.	11	NA	-	11	NA
Mixed Paper, Office	-	NA			NA
Mixed Metals	11	NA	5	5	NA
Mixed Plastics	35	NA	4	31	NA
Mixed Recyclables	-	NA			NA
Mixed Organics	-	NA	NA		
Mixed MSW	114	NA	NA	114	NA
Carpet	7		1	6	NA
Personal Computers	7		1	6	NA
Clay Bricks	-		NA		NA
Concrete <sup>1</sup>	-	NA		NA	NA
Fly Ash <sup>2</sup>	-	NA		NA	NA
Tires <sup>3</sup>	11		4	7	NA

Please enter data in short tons (1 short ton = 2,000 lbs.)

Please refer to the User's Guide if you need assistance completing this table.

<sup>1</sup> Recycled concrete used as aggregate in the production of new concrete

<sup>2</sup> Recycled fly ash is utilized to displace Portland cement in concrete production.

<sup>3</sup> Recycling tires is defined in this analysis as retreading and does not include other recycling activities (i.e. crumb rubber applications).

3. To estimate the benefits from source reduction, EPA usually assumes that the material that is source reduced would have been manufactured from the current mix of virgin and recycled inputs. However, you may choose to estimate the emission reductions from source reduction under the assumption that the material would have been manufactured from 100% virgin inputs in order to obtain an upper bound estimate of the benefits from source reduction. Select which assumption you want to use in the analysis.

☒ Current Mix
   
☐ 100% Virgin

- 4a. The emissions from landfilling depends on whether the landfill where your waste is disposed has a landfill gas (LFG) control system. If you do not know whether your landfill has LFG control, select "National Average" to calculate emissions based on the estimated proportions of landfills with LFG control in 2004. If your landfill does not have a LFG system, select "No LFG Recovery" and go to question 5. If a LFG system is in place at your landfill, select "LFG Recovery" and click one of the indented buttons in 4b to indicate whether LFG is recovered for energy or flared.

☒ National Average
   
☐ LFG Recovery
   
☐ No LFG Recovery

- 4b. If your landfill has gas recovery, does it recover the methane for energy or flare it?

☒ Recover for energy
   
☐ Flare
   
☐ Not Applicable

- 4c. If your landfill has gas recovery, what is the efficiency of the system?

The national analysis assumes a gas collection system efficiency of 75%. If you do not know what the efficiency of your system is, you may want to use 75% as a default.

# Analysis Inputs

Landfill Gas Collection System Efficiency: 75%

- 5a. Emissions that occur during transport of materials to the management facility are included in this model. You may use default transport distances, indicated in the table below, or provide information on the transport distances for the various MSW management options.

☒ Use Default Distances

☐ Provide Information

- 5b. If you have chosen to provide information, please fill in the table below. Distances should be from the curb to the landfill, combustor, or material recovery facility (MRF). \*Please note that if you chose to provide information, you must provide distances for both the baseline and the alternative scenarios.

Management Option	Default Distance (Miles)	Distance (Miles)
Landfill	20	
Combustion	20	
Recycling	20	
Composting	20	

6. If you wish to personalize your results report, input your name & organization, and also specify the project period corresponding to the data you entered above.

Name

Organization

Project Period From to

- 7 Please select between displaying units in metric tons of carbon equivalent (MTCE) and metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>E).

☐ MTCE

☒ MTCO<sub>2</sub>E

8. Check the button below to see results in units of energy consumption (million BTU) and equivalencies (e.g., cars off the road).

☐ Energy Consumption (million BTU)

**Congratulations! You have finished all the inputs.**  
A summary of your results awaits you on the sheet(s) titled "Summary Report."  
For more detailed analyses of GHG emissions, see the sheet(s) titled "Analysis Results."

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**Prepared by:**

1. *Journal of the American Medical Association*, 1997; 278: 1039-1044.

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0 MTCO<sub>2</sub>E

This is equivalent to...

Passenger Cars from the  
Roadway Each Year

Note: a negative value (i.e., a value in parentheses) indicates an emission reduction; a positive value indicates an emission increase

-- available on the Internet at <http://epa.gov/climatechange/wycd/waste/downloads/fullreport.pdf> (5.6 Mb PDF file)

**Waste Reduction Model (WARM) -- Results**

<b>Total GHG Emissions from Baseline MSW Generation and Management (MTCO<sub>2</sub>E):</b>	(342)
<b>Total GHG Emissions from Alternative MSW Generation and Management (MTCO<sub>2</sub>E):</b>	(342)
<b>Incremental GHG Emissions (MTCO<sub>2</sub>E):</b>	0

MTCO<sub>2</sub>E = metric tons of carbon dioxide equivalent**Per Ton Estimates of GHG Emissions for Alternative Management Scenarios**

<b>Material</b>	<b>GHG Emissions per Ton of Material Source Reduced (MTCO<sub>2</sub>E)</b>	<b>GHG Emissions per Ton of Material Recycled (MTCO<sub>2</sub>E)</b>	<b>GHG Emissions per Ton of Material Landfilled (MTCO<sub>2</sub>E)</b>	<b>GHG Emissions per Ton of Material Combusted (MTCO<sub>2</sub>E)</b>	<b>GHG Emissions per Ton of Material Composted (MTCO<sub>2</sub>E)</b>
Aluminum Cans	(8.29)	(13.67)	0.04	0.06	NA
Steel Cans	(3.19)	(1.80)	0.04	(1.54)	NA
Copper Wire	(7.41)	(4.97)	0.04	0.06	NA
Glass	(0.58)	(0.28)	0.04	0.05	NA
HDPE	(1.80)	(1.40)	0.04	0.91	NA
LDPE	(2.29)	(1.71)	0.04	0.91	NA
PET	(2.11)	(1.55)	0.04	1.07	NA
Corrugated Cardboard	(5.59)	(3.11)	0.33	(0.66)	NA
Magazines/third-class mail	(8.66)	(3.07)	(0.33)	(0.48)	NA
Newspaper	(4.89)	(2.80)	(0.89)	(0.75)	NA
Office Paper	(8.01)	(2.85)	1.76	(0.63)	NA
Phonebooks	(6.34)	(2.66)	(0.89)	(0.75)	NA
Textbooks	(9.18)	(3.11)	1.76	(0.63)	NA
Dimensional Lumber	(2.02)	(2.46)	(0.52)	(0.79)	NA
Medium Density Fiberboard	(2.22)	(2.47)	(0.52)	(0.79)	NA
Food Scraps	NA	NA	0.68	(0.18)	(0.20)
Yard Trimmings	NA	NA	(0.34)	(0.22)	(0.20)
Grass	NA	NA	0.15	(0.22)	(0.20)
Leaves	NA	NA	(0.58)	(0.22)	(0.20)
Branches	NA	NA	(0.52)	(0.22)	(0.20)
Mixed Paper, Broad	NA	(3.54)	0.27	(0.66)	NA
Mixed Paper, Resid.	NA	(3.54)	0.19	(0.66)	NA
Mixed Paper, Office	NA	(3.42)	0.38	(0.60)	NA
Mixed Metals	NA	(5.26)	0.04	(1.07)	NA
Mixed Plastics	NA	(1.52)	0.04	0.97	NA
Mixed Recyclables	NA	(2.88)	0.08	(0.60)	NA
Mixed Organics	NA	NA	0.15	(0.20)	(0.20)
Mixed MSW	NA	NA	0.37	(0.13)	NA
Carpet	(4.03)	(7.23)	0.04	0.37	NA
Personal Computers	(55.97)	(2.27)	0.04	(0.20)	NA
Clay Bricks	(0.29)	NA	0.04	NA	NA
Concrete	NA	(0.01)	0.04	NA	NA
Fly Ash	NA	(0.87)	0.04	NA	NA
Tires	(4.01)	(1.84)	0.04	0.08	NA

**GHG Emissions from Baseline Management of Municipal Solid Wastes**

<b>Material</b>	<b>Baseline Generation of Material (Tons)</b>	<b>Estimated Recycling (Tons)</b>	<b>Annual GHG Emissions from Recycling (MTCO<sub>2</sub>E)</b>	<b>Estimated Landfilling (Tons)</b>	<b>Annual GHG Emissions from Landfilling (MTCO<sub>2</sub>E)</b>	<b>Estimated Combustion (Tons)</b>	<b>Annual GHG Emissions from Combustion (MTCO<sub>2</sub>E)</b>	<b>Estimated Composting (Tons)</b>	<b>Annual GHG Emissions from Composting (MTCO<sub>2</sub>E)</b>	<b>Total Annual GHG Emissions (MTCO<sub>2</sub>E)</b>
Aluminum Cans	4	2	(21)	2	0	0	0	NA	NA	(21)
Steel Cans	6	4	(7)	2	0	0	0	NA	NA	(7)
Copper Wire	0	0	0	0	0	0	0	NA	NA	0
Glass	26	7	(2)	18	1	0	0	NA	NA	(1)
HDPE	0	0	0	0	0	0	0	NA	NA	0
LDPE	0	0	0	0	0	0	0	NA	NA	0
PET	0	0	0	0	0	0	0	NA	NA	0
Corrugated Cardboard	0	0	0	0	0	0	0	NA	NA	0
Magazines/third-class mail	19	8	(23)	11	(4)	0	0	NA	NA	(27)
Newspaper	24	19	(53)	5	(5)	0	0	NA	NA	(58)
Office Paper	14	10	(28)	4	7	0	0	NA	NA	(21)
Phonebooks	2	0	(1)	1	(1)	0	0	NA	NA	(2)
Textbooks	3	1	(2)	2	4	0	0	NA	NA	1

# Analysis Results (MTCO2E)

Dimensional Lumber	19	3	(7)	16	(9)	0	0	NA	NA	(16)
Medium Density Fiberboard	0	0	0	0	0	0	0	NA	NA	0
Food Scraps	71	NA	NA	71	48	0	0	0	0	48
Yard Trimmings	73	NA	NA	73	(25)	0	0	0	0	(25)
Grass	0	NA	NA	0	0	0	0	0	0	0
Leaves	0	NA	NA	0	0	0	0	0	0	0
Branches	0	NA	NA	0	0	0	0	0	0	0
Mixed Paper, Broad	114	64	(225)	50	14	0	0	NA	NA	(212)
Mixed Paper, Resid.	11	0	0	11	2	0	0	NA	NA	2
Mixed Paper, Office	0	0	0	0	0	0	0	NA	NA	0
Mixed Metals	11	5	(28)	5	0	0	0	NA	NA	(28)
Mixed Plastics	35	4	(5)	31	1	0	0	NA	NA	(4)
Mixed Recyclables	0	0	0	0	0	0	0	NA	NA	0
Mixed Organics	0	NA	NA	0	0	0	0	0	0	0
Mixed MSW	114	0	NA	114	42	0	0	NA	NA	42
Carpet	7	1	(4)	6	0	0	0	NA	NA	(4)
Personal Computers	7	1	(2)	6	0	0	0	NA	NA	(2)
Clay Bricks	0	NA	NA	0	0	NA	NA	NA	NA	0
Concrete	0	0	0	0	0	NA	NA	NA	NA	0
Fly Ash	0	0	0	0	0	NA	NA	NA	NA	0
Tires	11	4	(7)	7	0	0	0	NA	NA	(7)
<b>Total</b>	<b>568</b>	<b>131</b>	<b>(418)</b>	<b>436</b>	<b>76</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>(342)</b>

## GHG Emissions from Projected Alternative Management of Municipal Solid Wastes

Material	Baseline Generation of Material (Tons)	Projected Source Reduction (Tons)	Annual GHG Emissions from Source Reduction (MTCO <sub>2</sub> E)	Projected Recycling (Tons)	Annual GHG Emissions from Recycling (MTCO <sub>2</sub> E)	Projected Landfilling (Tons)	Annual GHG Emissions from Landfilling (MTCO <sub>2</sub> E)	Projected Combustion (Tons)	Annual GHG Emissions from Combustion (MTCO <sub>2</sub> E)	Projected Composting (Tons)	Annual GHG Emissions from Composting (MTCO <sub>2</sub> E)	Total Annual GHG Emissions (MTCO <sub>2</sub> E)
Aluminum Cans	4	0	0	2	(21)	2	0	0	0	NA	NA	(21)
Steel Cans	6	0	0	4	(7)	2	0	0	0	NA	NA	(7)
Copper Wire	0	0	0	0	0	0	0	0	0	NA	NA	0
Glass	26	0	0	7	(2)	18	1	0	0	NA	NA	(1)
HDPE	0	0	0	0	0	0	0	0	0	NA	NA	0
LDPE	0	0	0	0	0	0	0	0	0	NA	NA	0
PET	0	0	0	0	0	0	0	0	0	NA	NA	0
Corrugated Cardboard	0	0	0	0	0	0	0	0	0	NA	NA	0
Magazines/third-class mail	19	0	0	8	(23)	11	(4)	0	0	NA	NA	(27)
Newspaper	24	0	0	19	(53)	5	(5)	0	0	NA	NA	(58)
Office Paper	14	0	0	10	(28)	4	7	0	0	NA	NA	(21)
Phonebooks	2	0	0	0	(1)	1	(1)	0	0	NA	NA	(2)
Textbooks	3	0	0	1	(2)	2	4	0	0	NA	NA	1
Dimensional Lumber	19	0	0	3	(7)	16	(9)	0	0	NA	NA	(16)
Medium Density Fiberboard	0	0	0	0	0	0	0	0	0	NA	NA	0
Food Scraps	71	NA	NA	NA	NA	71	48	0	0	0	0	48
Yard Trimmings	73	NA	NA	NA	NA	73	(25)	0	0	0	0	(25)
Grass	0	NA	NA	NA	NA	0	0	0	0	0	0	0
Leaves	0	NA	NA	NA	NA	0	0	0	0	0	0	0
Branches	0	NA	NA	NA	NA	0	0	0	0	0	0	0
Mixed Paper, Broad	114	NA	NA	64	(225)	50	14	0	0	NA	NA	(212)
Mixed Paper, Resid.	11	NA	NA	0	0	11	2	0	0	NA	NA	2
Mixed Paper, Office	0	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Metals	11	NA	NA	5	(28)	5	0	0	0	NA	NA	(28)
Mixed Plastics	35	NA	NA	4	(5)	31	1	0	0	NA	NA	(4)
Mixed Recyclables	0	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Organics	0	NA	NA	NA	NA	0	0	0	0	0	0	0
Mixed MSW	114	NA	NA	NA	NA	114	42	0	0	NA	NA	42
Carpet	7	0	0	1	(4)	6	0	0	0	NA	NA	(4)
Personal Computers	7	0	0	1	(2)	6	0	0	0	NA	NA	(2)
Clay Bricks	0	0	0	NA	NA	0	0	NA	NA	NA	NA	0
Concrete	0	NA	NA	0	0	0	0	NA	NA	NA	NA	0
Fly Ash	0	NA	NA	0	0	0	0	NA	NA	NA	NA	0
Tires	11	0	0	4	(7)	7	0	0	0	NA	NA	(7)
<b>Total</b>	<b>568</b>	<b>0</b>	<b>0</b>	<b>131</b>	<b>(418)</b>	<b>436</b>	<b>76</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>(342)</b>

## Incremental GHG Emissions from Projected Alternative Management of Municipal Solid Wastes

Analysis Results (MTCO<sub>2</sub>E)

Material	Source Reduction (Tons)	Incremental GHG Emissions from Source Reduction (MTCO <sub>2</sub> E)	Incremental Recycling (Tons)	Incremental GHG Emissions from Recycling (MTCO <sub>2</sub> E)	Incremental Landfilling (Tons)	Incremental GHG Emissions from Landfilling (MTCO <sub>2</sub> E)	Incremental Combustion (Tons)	Incremental GHG Emissions from Combustion (MTCO <sub>2</sub> E)	Incremental Composting (Tons)	Incremental GHG Emissions from Composting (MTCO <sub>2</sub> E)	Total Incremental GHG Emissions (MTCO <sub>2</sub> E)
Aluminum Cans	0	0	0	0	0	0	0	0	NA	NA	0
Steel Cans	0	0	0	0	0	0	0	0	NA	NA	0
Copper Wire	0	0	0	0	0	0	0	0	NA	NA	0
Glass	0	0	0	0	0	0	0	0	NA	NA	0
HDPE	0	0	0	0	0	0	0	0	NA	NA	0
LDPE	0	0	0	0	0	0	0	0	NA	NA	0
PET	0	0	0	0	0	0	0	0	NA	NA	0
Corrugated Cardboard	0	0	0	0	0	0	0	0	NA	NA	0
Magazines/third-class mail	0	0	0	0	0	0	0	0	NA	NA	0
Newspaper	0	0	0	0	0	0	0	0	NA	NA	0
Office Paper	0	0	0	0	0	0	0	0	NA	NA	0
Phonebooks	0	0	0	0	0	0	0	0	NA	NA	0
Textbooks	0	0	0	0	0	0	0	0	NA	NA	0
Dimensional Lumber	0	0	0	0	0	0	0	0	NA	NA	0
Medium Density Fiberboard	0	0	0	0	0	0	0	0	NA	NA	0
Food Scraps	NA	NA	NA	NA	0	0	0	0	0	0	0
Yard Trimmings	NA	NA	NA	NA	0	0	0	0	0	0	0
Grass	NA	NA	NA	NA	0	0	0	0	0	0	0
Leaves	NA	NA	NA	NA	0	0	0	0	0	0	0
Branches	NA	NA	NA	NA	0	0	0	0	0	0	0
Mixed Paper, Broad	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Paper, Resid.	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Paper, Office	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Metals	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Plastics	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Recyclables	NA	NA	0	0	0	0	0	0	NA	NA	0
Mixed Organics	NA	NA	NA	NA	0	0	0	0	0	0	0
Mixed MSW	NA	NA	NA	NA	0	0	0	0	NA	NA	0
Carpet	0	0	0	0	0	0	0	0	NA	NA	0
Personal Computers	0	0	0	0	0	0	0	0	NA	NA	0
Clay Bricks	0	0	NA	NA	0	0	NA	NA	NA	NA	0
Concrete	NA	NA	0	0	0	0	NA	NA	NA	NA	0
Fly Ash	NA	NA	0	0	0	0	NA	NA	NA	NA	0
Tires	0	0	0	0	0	0	0	0	NA	NA	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

a) For explanation of methodology, see the EPA report:

Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks (EPA530-R-06-004)

-- available on the Internet at <http://epa.gov/climatechange/wywd/waste/downloads/fullreport.pdf> (5.6 Mb PDF file).

b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.